

# COCKPIT ELEMENTS

While flying, your immediate environment consists of:

- ◆ The cockpit
- ◆ The [Head-Up Display](#) (or HUD)
- ◆ [Instrument windows](#) that you can open and close
- ◆ Your view of the outside, controlled by [View Controls](#)

## The Cockpit

You can display the cockpit for added realism or hide it to increase visibility.

**Backspace**

Show or hide the cockpit (toggle). (You can also use the `SHOW COCKPIT?` option on the `PREF` menu of the *In-Flight* menu bar.)

**Esc**

Pause the game and call up the [In-Flight menu](#) bar.

If the cockpit is displayed, you can also have rear-view mirrors. These can be toggled with the `REAR VIEW WINDOWS?` option on the `PREF` menu of the *In-Flight* menu bar.

## HEAD-UP DISPLAY (HUD)

A HUD is a transparent sheet between the pilot and the glareshield upon which critical information is projected. The HUD reduces the need to look down at cockpit instruments, allowing a pilot to concentrate on combat.

Shift [I] and Shift [J]

Dim and brighten HUD. (You can also choose these options from the **PREF** menu of the *In-Flight* menu bar.)

The HUD has two modes, **Navigation** and **Weapons**. Weapons mode is the default.

**[N]** Toggle HUD between Weapons mode (LCOS appears in the lower left corner of the HUD) and Navigation mode (NAV or ILS appears).

The [HUD Menu](#) lists pages that display pictures of HUDs. On these pages, the HUDs' features have been linked to text descriptions. Click on each feature to view a description of it.

# HUD Menu

Cockpit Elements

## Constant HUD Features

[General](#)

[Thrust Vectoring Aircraft](#)

[STOVL Aircraft](#)

**Constant HUD Features** are features common to both Weapons and Navigation modes.

## Weapons Mode Features

[General](#)

[Missiles and Guided Bombs](#)

[Unguided Bombs \(CCIP\)](#)

[Guns](#)

**Weapons Mode Features** are specific to the HUD in Weapons mode.

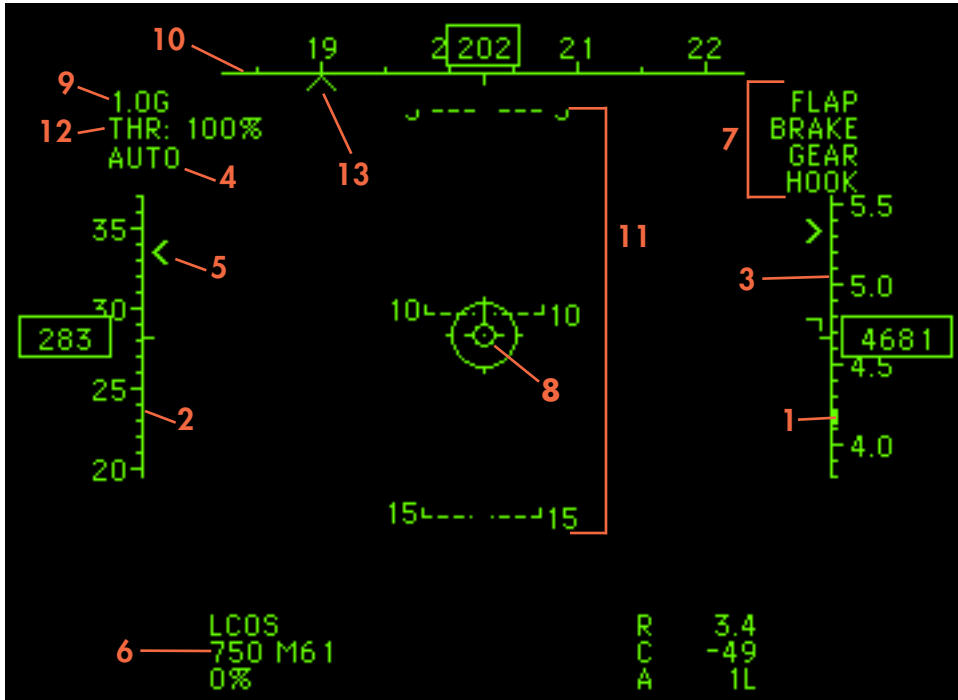
## Navigation Mode Features

[General](#)

[Inertial Landing System](#)

**Navigation Mode Features** are specific to the HUD in Navigation mode.

# Constant HUD Features: General



HUD Menu

**1. Above Ground Level (AGL) Indicator.** This bar on the altitude tape indicates your altitude above the terrain. As you fly over land, ground level changes. For example, when flying over a mountain, you could be 5,000 feet above sea level but only 200 feet above the ground. Pay particular attention to the AGL when flying in clouds or fog.

**2. Airspeed Tape.** The airspeed tape scrolls up and down, indicating changes in airspeed. Your current airspeed is also displayed numerically at the center of the tape. Brackets show your maximum and minimum (or stall) speeds.

In *ATF*, your airspeed indicator measures **true airspeed** and not **indicated airspeed**. Indicated airspeed is the speed the aircraft would be travelling if it were at sea level on a standard day, and is the reading typically found on an airspeed indicator. True airspeed is the speed the aircraft is actually travelling — the flight computer returns this measurement by correcting indicated airspeed to reflect current temperature and air pressure conditions.



**3. Altitude Tape.** The altitude tape scrolls up or down, indicating changes in altitude ASL (Above Sea Level). Your current altitude is displayed numerically at the center of the tape.

When the Instrument Landing System (ILS) is engaged, additional marks indicate your current vertical speed (how fast you are diving or climbing) and the maximum advised vertical speed for landing. For details on the ILS, see [Additional Navigation Mode Features](#).

**4. Auto.** Indicates that the autopilot is engaged and steering your aircraft to the current waypoint.



Turn the autopilot on/off.

**5. Corner Velocity Indicator.** The corner velocity (or speed) indicator shows your [corner speed](#) at your current altitude. The indicator is *below* the numeric airspeed readout if you're flying faster than corner speed. The indicator is *above* the numeric airspeed readout if you're flying slower than corner speed.



**6. Current Weapon Indicator.** Indicates the current weapon and the number of rounds left.



Cycle through weapons.

**7. Flaps, Gear, Brakes, Hook and Bay.** The upper right-hand corner of the HUD indicates the flap, gear, brake, hook and bay status. If FLAPS, GEAR, BRAKE or HOOK appears in the upper right corner, then the specified device is extended. If the word does not appear here, the device is retracted. If BAY appears, then the weapons bay is open; if not, it is closed.



Toggle flaps



Toggle brakes.



Toggle landing gear.



Toggle the arrestor hook (Rafale C).



Open/close the weapons bay (on the F-117, B-2, X-32 and F-22 only).



**8. Flight Path Indicator.** The Flight Path Indicator shows which direction the aircraft is actually moving, regardless of its flight attitude. When **Angle of Attack (AoA)** is positive, the Flight Path Indicator is below the HUD's center. When the AoA is negative, the Flight Path Indicator is above the HUD's center.

**9. G-Meter.** The G-meter shows how many G's the aircraft is currently pulling. (See **G-Forces**.)

**10. Heading Tape.** The heading tape is your compass. It scrolls right and left, indicating changes in your heading. Your current heading is displayed numerically at the center of the tape. The tape ranges from  $1^{\circ}$  to  $360^{\circ}$  with tick marks every  $10^{\circ}$ .

$0^{\circ}$     Due north

$180^{\circ}$     Due south

$90^{\circ}$     Due east

$270^{\circ}$     Due west





**11. Pitch Ladder.** The pitch ladder indicates the aircraft's pitch and roll relative to the horizon.

The center of the HUD always represents where the nose of your aircraft is pointing. Each pitch ladder line represents  $5^\circ$  above or below the horizon. Positive pitch lines — indicating that the nose is pointed above the horizon — are solid. Negative pitch lines — indicating that the nose is pointed below the horizon — are represented by dashed lines. The ends of the pitch lines always point toward the horizon.

The pitch ladder lines also act as an artificial horizon. Think of them as representing your wings: when the lines are horizontal (relative to the bottom of your screen), your wings are parallel to the horizon. When the lines are vertical, your wings are perpendicular to the horizon.



**12. Thrust Indicator.** The thrust indicator shows the engine's current throttle setting as a percentage of maximum possible engine output. AFT indicates that afterburners have been lit.

The following **keyboard** keys control thrust:

- 1            0% thrust
- 2            25% thrust
- 3            50% thrust
- 4            75% thrust
- 5            100% thrust
- 6            100% thrust plus afterburners
- 7            Decrease thrust by 5%
- 8            Increase thrust by 5%

(**Note:** The B-2 and F-117 do not have afterburner capabilities.)



**13. Waypoint Indicator.** The waypoint indicator caret moves along the underside of the heading display showing the direction to the selected waypoint. When the indicator is centered on the heading tape, you are flying directly at the next waypoint.

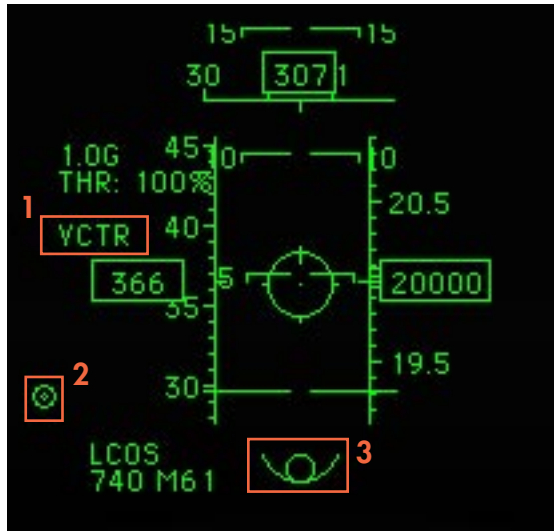


## Constant HUD Features: Thrust Vectoring Aircraft

The F-22, X-31 and X-32 employ strake flaps on the engine outlet nozzles which redirect the engine's thrust and change the pitch or yaw of the airplane's nose without moving control surfaces or dipping the wings. This is called *thrust vectoring*. In the F-22 and X-32, the pilot can vector thrust to change the aircraft's pitch; in the X-31, he can alter both yaw and pitch.

Ctrl +    

Control the direction of vectored thrusting.



HUD Menu

**1. VCTR.** Appears in the upper right corner of the HUD when the thrust angle does not equal  $0^\circ$  (i. e., straight back, normal flight angle).

**2. Original Flight Path Indicator.** This marker appears on your HUD when you begin to vector thrust. It marks your original flight path when you initiated thrust vectoring. Reposition the position of nose over this marker to return to normal flight.

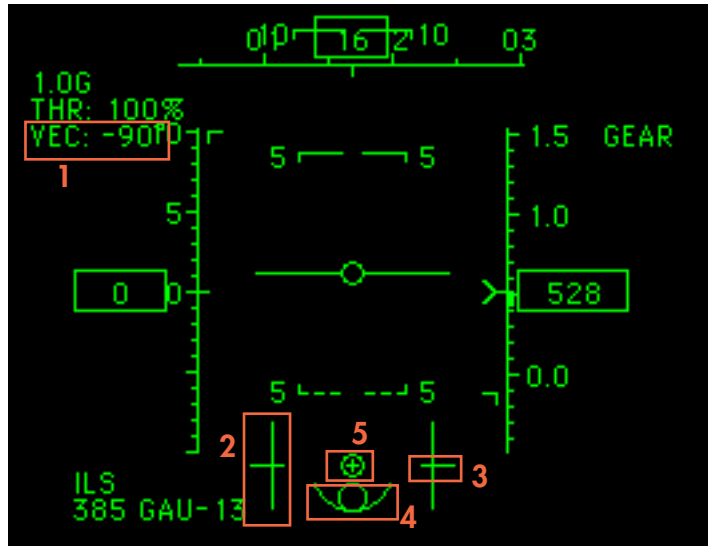
**3. Stability Indicator.** This graphic representation of an aircraft's stability appears only on the HUDs of the X-29, X-31 and X-32.

Normal    Less stable    Midpoint    Unstable    Near stall



## Constant HUD Features: STOVL Aircraft

In addition to strake flaps, the X-32 ASTOVL uses a lift fan to launch the craft vertically off of the ground, take off from a short runway, hover or land vertically. On the AV-8B, Yak 141 and Sea Harrier the main engine nozzles can be rotated downward to execute the same maneuvers.



**1. Vector Angle.** Indicates the angle of the vector nozzles. At  $0^\circ$ , the nozzles point straight back (normal flight position). At  $-90^\circ$ , they point straight down.



Rotate nozzles  $-10^\circ$  (downward).



Rotate nozzles to  $-90^\circ$  position; press again to rotate to  $-100^\circ$  ( $-120^\circ$  in the ASTOVL).



Rotate nozzles  $+10^\circ$  (upward and backward).



Rotate nozzles to  $0^\circ$  position (or to  $-90^\circ$  if previously at  $-100^\circ/-120^\circ$ ).

**2. Vertical Velocity Bars.** Ticks on the vertical velocity bars move up and down, indicating your climb and sink rate. The lower edge of the vertical bars marks the point at which you begin to stall rather than sink.



**3. Zero Sink Rate Point.** The centerline markers on the vertical velocity bars indicate the “zero sink rate” position, or the point at which the craft can hover.

**4. Stability Indicator.** This graphic representation of an aircraft's stability appears only on the HUDs of the X-29, X-31 and X-32.

Normal    Less stable    Midpoint    Unstable    Near stall

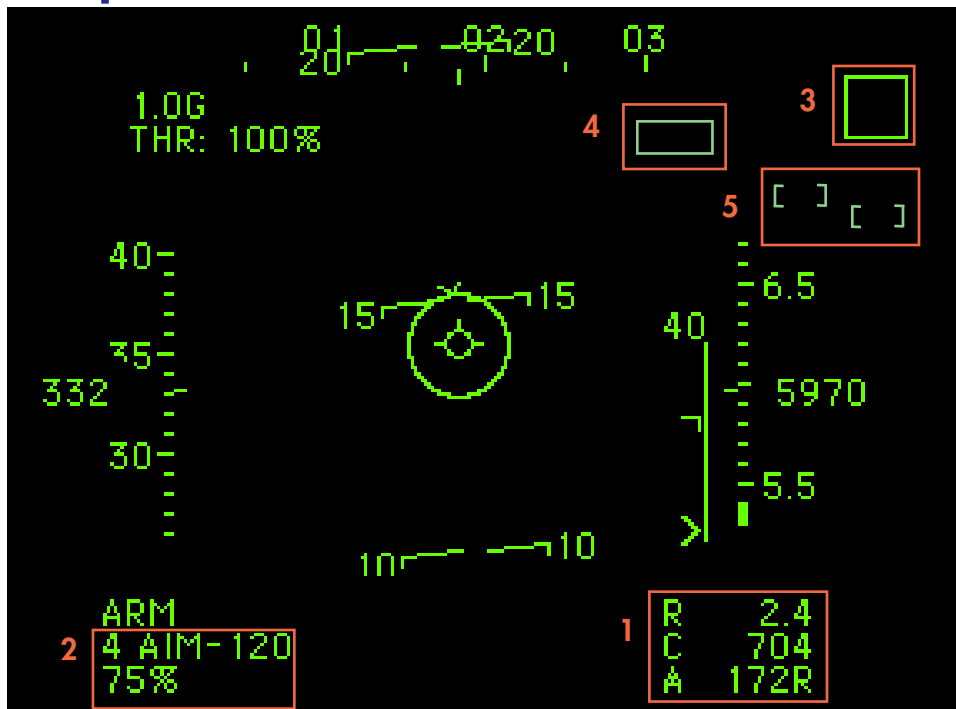




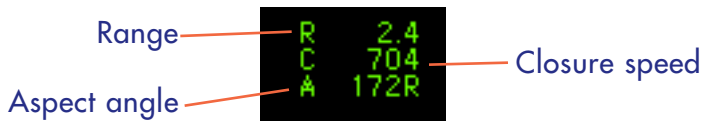
**5. Horizontal Velocity Marker.** This circle indicates forward/back and side-to-side movement. The cross hairs in the center indicate zero horizontal velocity — that is, the point at which the aircraft hovers. If the circle is centered on the cross hairs, the aircraft hovers. When the circle slips to the side, forward or back, the aircraft is traveling in that direction. The radius of the circle represents movement at 10 knots in any direction. For example, if the forward edge of the circle moves over the center of the cross hairs, then the airplane is drifting backwards at 10 knots.



# Weapons Mode Features: General



HUD Menu



**1a. Range.** Indicates the range to the target in nautical miles (nm).

**1b. Closure Speed.** Appears beneath the range indicator showing the target's speed relative to yours. A positive closure means you are getting closer to the target, a negative closure means it is moving away.

**1c. Aspect Angle.** Indicates a targeted aircraft's aspect angle in degrees. The aspect angle is the angle between the target's tail and your airplane's line of sight. At 0°, you are looking at the target's tail. 90L means that you are looking directly at the target's left wing; 45R means you're looking at the right wing from a 45° angle.





**2a. Hit Probability.** Shows the weapon's current hit probability. The percentage takes into account all factors which may affect the missile's overall chance to hit, such as weather and distance to target, but does not consider enemy maneuvering. IN RNG appears next to the hit probability when the target is within the weapon's minimum/maximum range.

**Note:** Your missile must have a lock — not just a minimum hit percentage — in order to have any chance of hitting its target.

**2b. Current Weapon Indicator.** Displays the number and type of the currently selected weapon.


[ ] or [ ] Cycle through weapons.

[Shift][8] Display the number remaining for all weapons.



**3. R/V TD Box.** The Radar/Visual Target Designator box, or R/V TD box, is superimposed on the HUD over a visual target (or radar target, if the target is outside of visual range).

**4. IR/L TD Box.** The Infrared/Laser Target Designator box is superimposed on the HUD over an IR- or Laser-designated target.

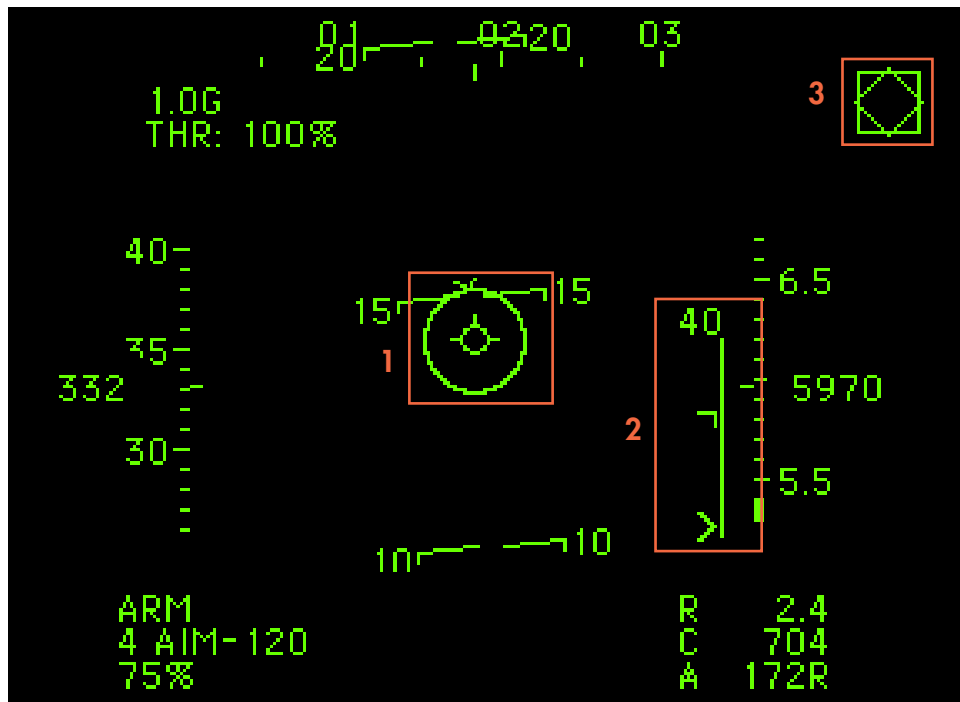
**Note:** You must have IR/LASER ADVANCED TARGETING on the **PREF** menu of the In-Flight menu bar active and be in IR sensor mode for the IR/L TD box to appear. (Press  to switch to IR sensor mode.)

**5. IR/L Designator Brackets.** When IR/LASER ADVANCED TARGETING is active on the **PREF** menu of the *In-Flight* menu bar, and you are in IR sensor mode, brackets are superimposed on the HUD over all available infrared-emitting objects, even if they are beyond visual range.

See [Targeting](#) for an explanation of IR/Laser and Radar/Visual targeting systems and targeting commands.



## Weapons Mode: Missiles and Guided Bombs



HUD Menu



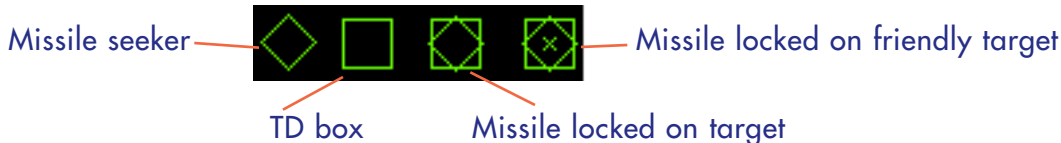
**1. Aiming Reticle and Aspect Angle.** The aiming reticle represents the currently selected missile. This circle remains fixed while the aspect angle caret moves around it. The aspect angle caret illustrates the angle between the target's flight path and your missile's line of sight to the target.

If the aspect angle indicator is at the top of the aiming reticle, the target is heading directly toward you. If it's at the bottom of the aiming reticle, the target is heading directly away from you. If the indicator is on either side, you are flying perpendicular to your target.



**2. Weapon Range Scale.** The vertical scale to the side of the aiming reticle shows your weapon's minimum and maximum range. The scale range is listed at the top of the indicator. The target marker indicates where the current target falls within the missile's range. If the target is outside of the missile's range, the target marker does not display.

**3. Missile Seeker.** A guided missile's seeker (the tracking device in its nose) is represented by a floating diamond on the HUD. When the seeker acquires its target, this diamond locks inside the TD box. The missile is now tracking the target. You can fire as soon as you're in a good firing position.

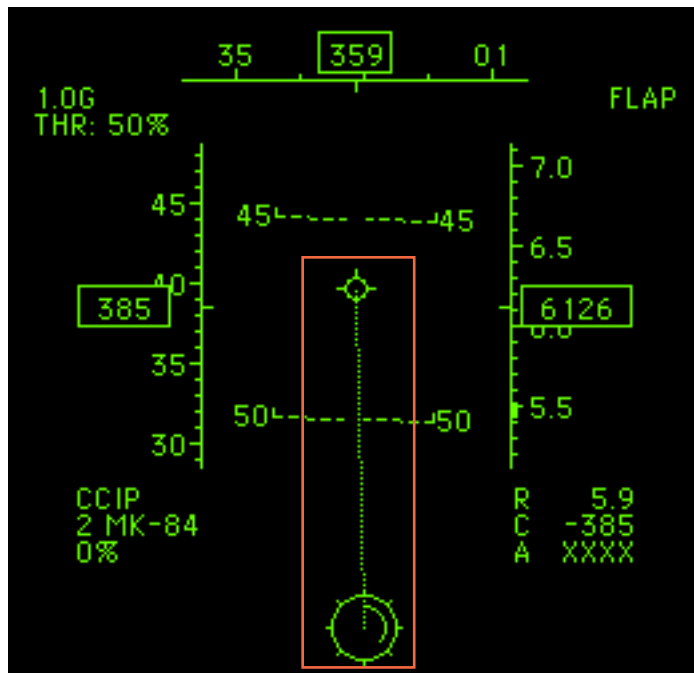


**Note:** If you have AUTHENTIC RADAR CRT AND SEEKER active on the **PREF** menu of the In-Flight menu bar, the diamond will flash when the seeker acquires a target.





## Weapons Mode: Unguided Bombs

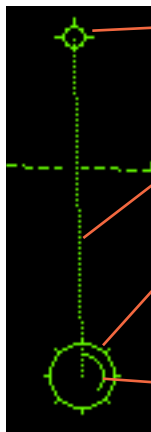


\* For all aircraft except the B-2.

For info specific to the B-2, see [Dropping Bombs from the B-2](#)

HUD Menu

**Constantly Calculated Impact Point (CCIP).** Once you select an un-guided bomb as your weapon, the point at which the bomb will impact once released is constantly re-calculated and projected onto your HUD.



**Center of HUD**

**Path bomb will follow when released**

**Impact point**

In level flight the impact point may not appear on screen, dive to bring it into view.

**Range** from current position to impact point.

When this inner arc forms a complete circle, the target point is 10,000 feet or more away; at a half-circle, the target point is 5,000 feet away. Accuracy decreases as range increases, effectively limiting bombs to a 2nm (approx. 10,000ft.) range.



## Dropping Unguided Bombs from the B-2A

The B-2A has a **High Altitude (HA) bomb camera** that allows you to visually track your target and release your bomb without diving.

To use this camera:

- [ ] [ ] Select a bomb as your weapon.
- [ T ] Target an object.

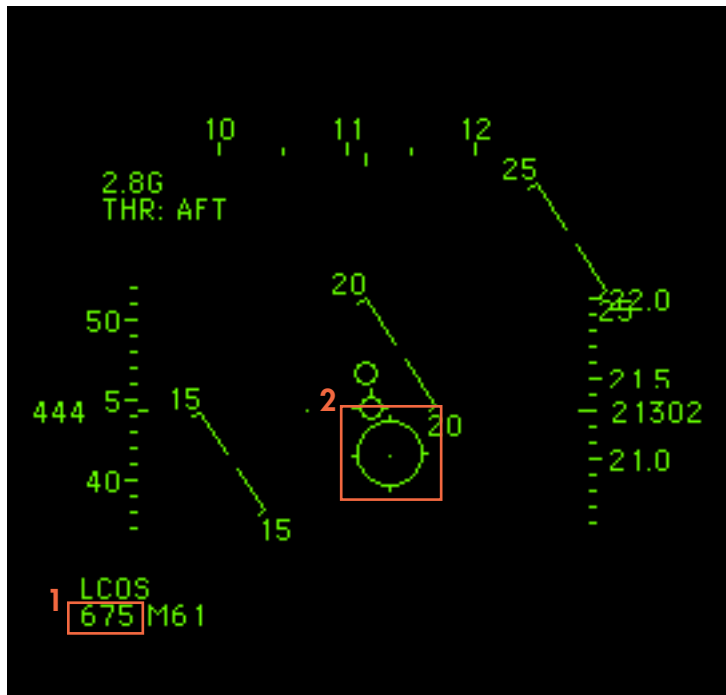
The Target Window opens automatically, with the view from the bomb camera in the window.



The camera films the ground **beneath and to the front** of your window. If you fly directly over your target, it will appear in the Target Window. To maximize your hit probability, drop your bomb when the target reaches the center of the window.



## Weapons Mode: Guns



HUD Menu

**1. Rounds Remaining.** When you select a gun as your weapon, the number of rounds remaining appears in the lower left corner of the HUD, along with the type of gun your aircraft carries.

**2. Pipper.** The pipper is used to aim the gun — it functions in two ways, depending on whether you have your **radar on** or **off**.

### **Radar off:**

The pipper indicates where a bullet will be when it is 1,000 feet away from your airplane (calculating a slight drop due to gravity). If your target is beyond 1000ft, lead it more (i.e., aim the gun in front of the target). If the target is closer than 1000ft, aim behind it.

### **Radar on:**

When you select a target, the pipper changes range to match that of the target and automatically calculates lead requirements. As you close in on a target, a thick arc moves around pipper, indicating where the target is within your gun's maximum range.



Target  
within  
100ft



Target at  
50% of gun's  
max. range



Target at or  
beyond gun's  
max. range



# Navigation Mode Features: General



**Range.** The distance to the current waypoint in nautical miles (nm).

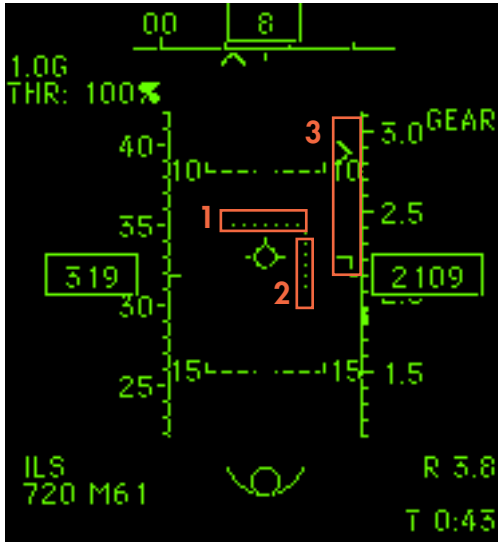
**Time.** The time to the next waypoint based on your current airspeed in minutes:seconds.

Range

Time

HUD Menu

# Navigation Mode Features: Instrument Landing System



ILS provides landing guidance. It cannot be manually activated, but will appear automatically under the following conditions:

- ◆ HUD in Navigation mode
- ◆ Gear (and hook, if landing on a carrier) down
- ◆ Within 5nm of a runway
- ◆ Under 4,000 feet of altitude

**1. Glide Slope Indicator.** This horizontal dotted line indicates your height above the runway. The dots are tightly spaced when following a good approach and loosely spaced when outside approach parameters.

**2. Localizer Deviation Bar.** This dotted vertical line indicates how well you are lined up with the runway. The dots are tightly spaced when following a good approach and loosely spaced when outside approach parameters.

**Note:** When the dotted lines form a cross in the center of your HUD, you're on the glide path for a correct landing.

**3. Velocity Indicators.** These brackets mark the range of speed advisable for a good landing. Keep the scrolling caret between the brackets.





# INSTRUMENT DISPLAY WINDOWS

Cockpit Elements

Instrument Display Windows display important instruments, views, and information in the corners of your screen.

To make the windows smaller, deselect **LARGE WINDOWS** from the **PREF** menu. A maximum of four windows can be open at a time (six if **LARGE WINDOWS** is deselected). After four (six), you must close a window before you can open another. (Closing unnecessary windows increases the game's frame rate.)

Press the following keys to toggle windows open and closed:

<b>Shift</b> 1	<u>Flight Envelope Window</u>	<b>Shift</b> 6	<u>Nav Window</u>
<b>Shift</b> 2	<u>Front View or IR/Laser Target Window</u>	<b>Shift</b> 7	<u>System Status Window</u>
<b>Shift</b> 3	<u>Other View Window</u>	<b>Shift</b> 8	<u>Weapons Status Window</u>
<b>Shift</b> 4	<u>Target or Radar/Visual Target Window</u>	<b>Shift</b> 9	<u>Radar Window</u>
<b>Shift</b> 5	<u>Radar Warning Receiver (RWR) Window</u>	<b>Shift</b> 0	<u>Radar Cross-Section (RCS) Window</u>

# Flight Envelope Window

The flight envelope is basically a series of graphs showing the aircraft's minimum and maximum speed and turn performance at different altitudes.

**Shift 1**

Toggle the **Flight Envelope Window**.



## Performance Limit Curves

**Stall Speed.** This curve marks the speed at which the aircraft stalls at different altitudes. If the dot representing your aircraft moves toward this curve, increase speed to avoid stalling.

**Service Ceiling.** Your aircraft can't climb above this altitude because the air becomes too thin to generate added lift.

**Thrust Limit.** This curve marks your max. speed limits at higher altitudes. Your engines can't produce enough thrust to go beyond these speeds.

**Structure Limit.** This curve marks the maximum speeds your airframe can handle. If the dot representing your aircraft moves too far beyond this limit, your wings will tear off. You should slow down immediately.



## Flight Envelope Window Modes



### Current curve

This is the default mode, which shows your aircraft's performance limits under the G-load it is currently pulling.

### Compare curves

This mode displays your flight envelope over that of your currently selected target. Areas where the opponent holds the advantage are shaded red.

### All curves

This mode displays the flight envelopes for all G-loads your aircraft is capable of. (G-loads and the **all curves** mode are explained on the next page.)



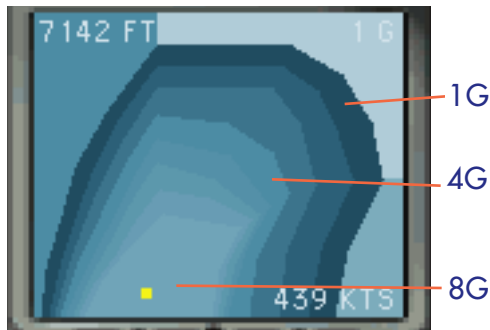
## G-Loads and the All Curves Mode

Each flight envelope is defined by the number of G's your aircraft can pull. G-loads are explained in detail under [G-Forces](#); However, the window can be explained here briefly.

Basically, the more G's you pull, the harder you can turn. If you are engaged in a turning fight, you want to get into a high-G envelope to achieve maximum maneuverability.

Each curve on the chart tells you the maximum G-load you can pull inside that curve. The outermost curve represents 1G. In the picture above, the aircraft could make an 8G turn at its current altitude and airspeed, even though it's currently on pulling 1G.

To pull more G's than would be normally possible, choose EXTRA G's from the **CHEAT** menu of the *In-Flight* menu bar.



# Front View or IR/Laser Target Window

Since you can't always look ahead during a dogfight, the Front View Window shows you where you're going while your head is turned. This compensates for the fact that in reality you can shift views more quickly than in a simulation.

Shift 2

Toggle **Front View** or **IR/Laser Target Window**.



If IR/Laser Targeting is active ...

Instrument Windows

## If IR/Laser Advanced Targeting is Active...

If IR/LASER ADVANCED TARGETING is active and you have an IR target designated, a camera view of your target will appear in this window.

This window corresponds to the [Radar/Visual Target Window](#), which tracks only radar and HARM targets if you have IR/LASER ADVANCED TARGETING active. The same symbols are used both windows.



As soon as you fire a laser-guided weapon, the view from the nose of the missile is displayed in this window until the missile explodes. **Don't switch IR targets or fire another missile until you see the explosion;** otherwise, the missile will lose its lock on the target.



# Other View Window

The Other View Window lets you display another camera view throughout the mission.

Shift 3

Toggle Other View Window.

Current altitude

Corner speed markers

If the asterisk is above the bar, you're flying faster than corner speed; below the bar, you're flying slower than your corner speed.



Current airspeed

To change the view in the Other Window ...

Instrument Windows



To change the view in the Other Window view:

1. Switch to another camera view using keys **F2**—**F12**.
2. Press **V** to set the view as your Other View.
3. The Other View Window automatically appears.
4. Switch back to Forward View (or any other view).

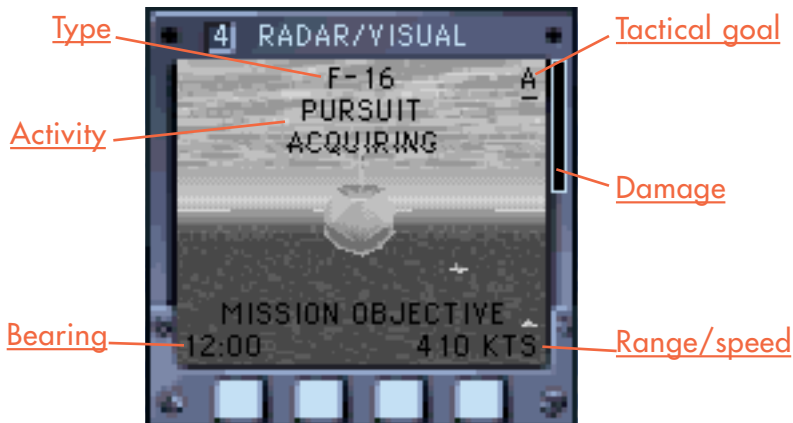


# Radar/Visual Target Window

The Radar/Visual Target Window lets you view your currently selected target and see data on its skill and activities.

**Shift 4** Toggle the Radar/Visual Target Window.

If IR/LASER ADVANCED TARGETING is active, this window displays information for radar targets only — IR and laser targets appear in the IR/Laser Target Window.



**Activity.** A target's *activity* tells you specifically what he's doing in order to complete his Tactical Goal. This can range from SEARCHING for other opponents to ACQUIRING, PURSUING or doing one of many maneuvers.

**Bearing.** The target's *bearing* is represented by hours on the clock, with 12 o'clock being the nose of your airplane and 6 o'clock being your tail. Hi and Lo provide a general idea of the target's altitude relative to your own.

**Damage.** *Damage* to the target is indicated by the vertical bar on the right side of the window. White represents damage to the target. When the bar is completely black, the target has taken no damage. When the bar is completely white, the target is destroyed. Damaged computer opponents suffer reduced turn performance and reduced thrust.



**Tactical Goal.** A target's **tactical goal** can be one of six things, represented by one of the following markers:

<b>A</b>	Attack something other than you.	<b><u>A</u></b>	Attack you specifically.
<b>E</b>	Evade something other than you.	<b><u>E</u></b>	Evade you specifically.
<b>N</b>	Neutral — follow waypoints.	<b>T</b>	Take off.
<b>C</b>	Crash.	<b>L</b>	Land.

**Range.** The distance of the target from you, measured in nautical miles (nm).

**Skill.** The pilot's skill is marked by the number of dots displayed in the following manner:

<b>No dots</b>	<b>Novice</b>	An easy target. Don't expect fancy maneuvers from this guy.
<b>One</b>	<b>Average</b>	Hard to tell if this guy's an earthworm or an eagle.
<b>Two</b>	<b>Experienced</b>	Don't expect an easy fight. This guy's got some cards up his sleeve.
<b>Three</b>	<b>Ace</b>	A pro. He'll turn and burn with you until one of you earns yourself a nylon letdown.

**Type.** Identifies what type of target you're facing.



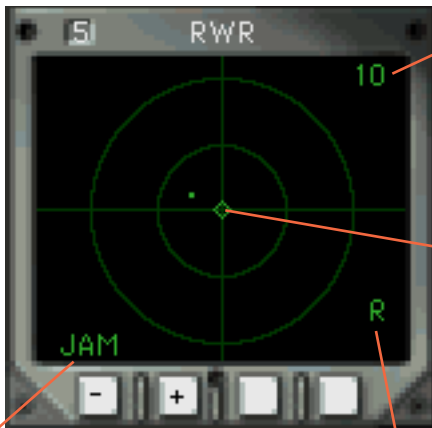
# Radar Warning Receiver (RWR) Window

The Radar Warning Receiver (RWR) Window displays all active radar sources around your aircraft.

**Shift** **5**

**Toggle the RWR Window.**

The center cross hairs represent your aircraft, with the top of the display indicating what's in front of you and the bottom of the display indicating what's behind you.



**Range**

**>** Increase

**<** Decrease

**Your aircraft**

RWR Symbology

**Jammer status**

**J** Toggle on/off

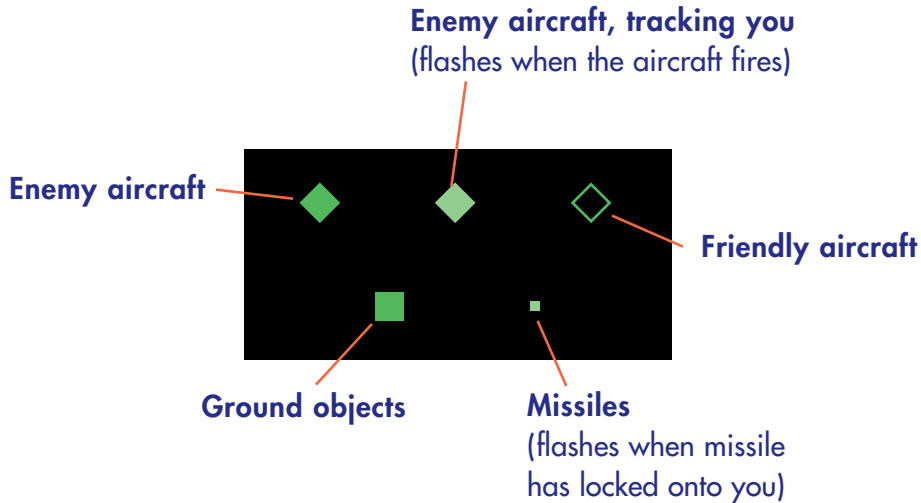
**Missile tracking indicator**

**R** Drop chaff (**Ins**)

**I** Release flares (**Del**)

Instrument Windows

# RWR Symbology

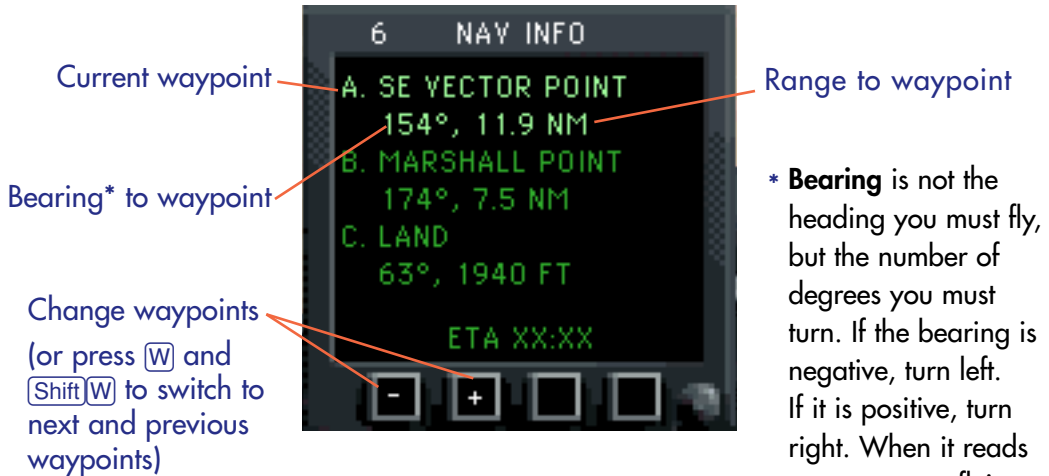


**Note:** Your missiles will also appear on the RWR, so pay attention — don't confuse one of your missiles for an enemy one.



# Nav Window

The Nav Window shows bearing and range to waypoints along with the estimated time of arrival (ETA) in minutes:seconds. The currently selected waypoint is always highlighted. Waypoints must be manually selected unless autopilot is active.



\* **Bearing** is not the heading you must fly, but the number of degrees you must turn. If the bearing is negative, turn left. If it is positive, turn right. When it reads zero, you are flying toward the waypoint.

# System Status Window

The System Status Window displays throttle, engine temperature, oil pressure and hydraulic pressure. (100% is normal, except for temperature — at 0%, temperature is normal.) This window is useful for assessing systems damage and viewing fuel levels.

Shift 7

Toggle the **System Status Window**





# Weapons Status Window

The Weapons Window displays the number and type of weapons the aircraft currently carries and how many chaff and flare remain. (Your HUD only indicates the number remaining for the active weapon.)

Shift 8

Toggle the **Weapons Status Window**.

Current weapon

Cycle through weapons  
(also [I] and [J])



# Radar Window

The Radar Window is perhaps the most important display window — it displays returns from your sensor devices (radar, IR and HARM) that allow you to locate and target objects.

Radar topics on the following pages include:

- ◆ [Opening and Closing the Radar Window](#)
- ◆ [RWS/TWS Indicator](#)
- ◆ [Radar Contacts](#)
- ◆ [Standard Radar CRT vs. Authentic Radar CRT and Seeker](#)
- ◆ [Target Elevation and Azimuth](#)
- ◆ [Historical Mode](#)
- ◆ [Selecting Targets on the Radar Window](#)
- ◆ [Switching Sensors \(Radar, IR and HARM\)](#)

## Opening and Closing the Radar Window

### To open the window:

1. Activate a sensor (press **[R]** for radar, **[I]** for IR or **[M]** for HARM).
2. Press **[Shift][9]** to open the Radar Window.

### There are two ways to close the window:

- ◆ Deactivate your sensor.  
(Press **[R]**, **[I]** or **[M]** again, depending on which is active.)
- ◆ Press **[Shift][9]** again.  
(However, your sensor remains on until you turn it off.)



## RWS/TWS Indicator


TWS/RWS indicator



If your **radar** is active, the TWS/RWS indicator in the upper left corner of the Radar Window tells you which mode your radar is in.

**RWS (Range While Search) mode** uses continuous wave emissions to provide contact range and bearing at extremely long ranges. Primarily a scanning mode, RWS cannot provide detailed tracking information. RWS mode engages automatically when you increase radar range past maximum tracking range.

**TWS (Track While Scan) mode** uses pulse-Doppler radar to target a designated contact, providing detailed tracking information about it while still scanning for nearby contacts. TWS mode automatically engages when you decrease radar range to within maximum tracking range.

**You cannot target in RWS mode.** If you are having difficulty targeting an object, decrease your radar range (press ) until you are within TWS range.

[Maximum RWS and TWS Ranges for Player Aircraft](#)



## Maximum RWS and TWS Ranges for Player Aircraft

	Max RWS Range	Max TWS Range
B-2	150nm	50nm
F-22A	n/a	150nm
X-29	150nm	50nm
X-31	150nm	50nm
X-32	150nm	50nm
Rafale C	150nm	50nm

**Note:** The F-117A has IR sensors only.

Press  to decrease, or  to increase radar range.



# Radar Contacts

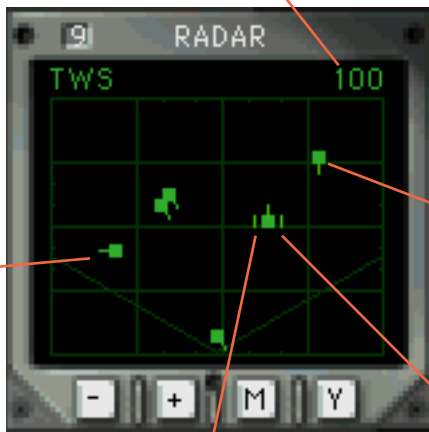
**Contacts** appear as small squares on the radar screen. In TWS mode, a little "flag" on indicates the direction the contact is heading, relative to you.

Contact on course perpendicular to yours

## Range in nautical miles (nm)

[<] Increases

[>] Decreases



Lines appear on either side of your current target

Since the **range** is 100nm, the horizontal lines on the display mark 100nm, 75nm, 50nm and 25 nm from top to bottom.

Contact at 75 nm, headed directly toward you

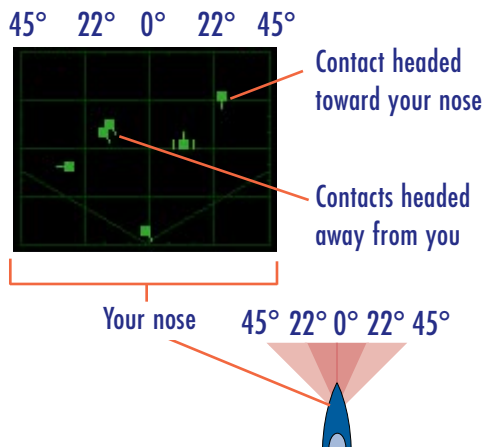
Contact at 50nm, headed away from you



## Standard vs. Authentic Radar CRT and Seeker

There is an option **PREF** menu on the *In-Flight* menu bar, called **AUTHENTIC RADAR CRT AND SEEKER**. By default, it is inactive (unchecked), and your **standard radar CRT** (Cathode Ray Tube) displays a top down view of what's in front of your airplane.

If you activate (check) this option, your Radar Window displays an **authentic radar CRT** with vertical lines indicating angles off your nose. The “flags” on contacts are relative to this angle.



Radar-guided missiles also behave more realistically:

- ◆ If a locked target leaves view, the lock is broken and must be reacquired.
- ◆ When you switch targets after the missile has locked, there is a delay as it re-orient on the new target.



## Target Elevation & Azimuth

Two arrows move along the left and bottom edges of the Radar Window. These arrows mark the targeted contact's elevation and azimuth, relative to your aircraft. (The same indicators are used on both authentic and standard radar CRTs.)

**Elevation indicator.** The arrow along the left edge of the scope shows the target's altitude relative to your own. If the target is beneath the plane of your nose, the elevation indicator moves below center. If the target is above the plane of your nose, the elevation indicator moves above center.

**Azimuth indicator.** The arrow on the bottom of the scope indicates target azimuth, or horizontal displacement. If the target is left of your nose, the azimuth indicator moves left of center and vice versa.





## Historical Mode

Press **Y** or click the Y button at the bottom of the Radar Window to activate your radar system's historical mode. In historical mode, your radar displays a series of dots behind each contact. The dots represent the “history” of the contact's movement over time. Press **Y** again to exit this mode.

## Selecting Targets on the Radar Window

You can target a contact by moving the mouse cursor onto the Radar Window and clicking on that contact. Two vertical lines, called “captain's bars,” surround it your current target.



## Switching Sensors (Radar, IR and HARM)

The Radar Window can display contact information picked up by your radar, IR-sensor and the seeker heads on HARM missiles.

**Radar** is best for finding and targeting aircraft. Interference from the ground makes it less useful for ground objects.

**[R]**      Activate radar (and de-activate IR or HARM sensor, if active).

**IR-sensors** detect objects based on their heat signatures. It can be used to locate ground objects and aircraft. If your aircraft does not have an onboard IR sensor, you must load a FLIR pod (available from the Surface-to-Air panel of the *Load Ordnance* Screen) onto a hardpoint.

**[I]**      Activate IR sensor (and de-activate radar or HARM sensor, if active).

**HARM** missiles home in on the radar signals of enemy targets. You must select a HARM missile as your weapon (**[I]** **[J]** cycle through weapons) before the Radar Window will display HARM data.

**[M]**      Activate HARM missile (and de-activate radar or IR sensor, if active).

For more information, see [Weapon Guidance Systems](#).



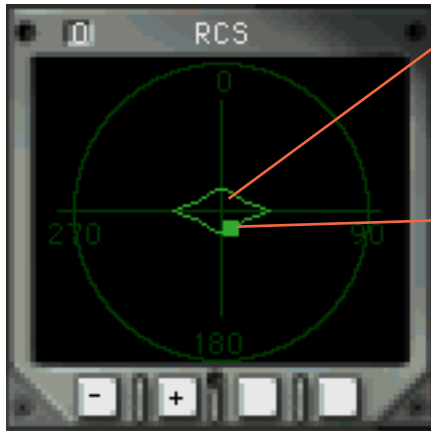
# Radar Cross-Section (RCS) Window

Like the RWR Window, the RCS Window provides a top-down view of the active radar sources surrounding your aircraft (you are at the center of the window), using the same symbology as the RWR.

**[Shift] 0**

Toggles the RCS Window.

The RCS window also displays your current radar cross-section (RCS).



The **curved, outlined shape** on the window represents your current radar cross-section.

The larger this “bubble,” the easier you are to detect in general.

**Radar emitters** inside the bubble have a better chance of detecting you than those outside of it. If a radar source is inside the shape, you may be able to turn so that it is outside the “bubble,” minimizing its ability to detect you.



**RCS** is a measure of radar signature (how much radar an airplane is reflecting back to a radar-emitting source). A small RCS indicates a “stealthy” aircraft, one with a greater chance of remaining “invisible” to radar.

The factors that influence an aircraft’s RCS are discussed under [Steath](#). One of these factors, **vertical surface area** varies according to the movement of the aircraft, and these variations are graphically represented in the RCS Window.

Why are an aircraft’s vertical surfaces so crucial to its RCS? Radar waves reflect off of a surface at an angle equal and opposite to their incoming level. When cruising, aircraft generally fly level, and their radars emit waves directly out in front of them. The vertical surfaces of objects in front of these aircraft reflect straight back, providing a stronger and more easily pinpointed signal than the non-vertical surfaces return.

An aircraft like the B-2 Spirit, for example, is stealthy in part because its vertical surface area is minimized. But were a B-2 to bank or pitch sharply, its huge horizontal wing surface would become a vertical surface, greatly increasing its RCS. Opening its weapons-bay doors or lowering gear would have a similar effect.



# VIEW CONTROLS

<b>F1</b>	<b>Forward</b>	Look ahead. This is your normal view — when in doubt, press <b>F1</b> .
<b>F2</b>	<b>Back</b>	Look behind you. This is your “check six” key.
<b>F3</b>	<b>Up</b>	Look above the standard <b>F1</b> view. Useful in a turning fight.
<b>F4</b>	<b>Tracking</b>	Follow the current target within the bounds of normal head rotation.
<b>F5</b>	<b>Player → Threat</b>	External view of your aircraft, facing the closest inbound missile.
<b>F6</b>	<b>Player → Wing</b>	External view of your aircraft, facing your wingman.
<b>F7</b>	<b>Player → Target</b>	External view of your aircraft, facing your current target.
<b>F8</b>	<b>Target → Player</b>	External view of your current target, facing your aircraft.
<b>F9</b>	<b>Fly By</b>	External view of your aircraft from a fixed point as it flies by.
<b>F10</b>	<b>External View</b>	External view of your aircraft.
<b>F12</b>	<b>Missile → Target</b>	External view of your missile, facing its current target.

[View Panning and Zooming](#)

[View Reference Keys](#)

## View Panning & Zooming

The Forward, Back, Up, Fly-By, and External views can be rotated or panned. Hold down the right-hand **[Shift]** key, and either move your joystick, or press **[←][→][↑][↓]**.

**[+]** or **[-]** Increase and decrease view magnification.

## View Reference Keys

**[Alt]** and **[Ctrl]** Change which object your view is referenced from.

**[Alt]** + camera view key Make view relative to your target instead of your aircraft.

**[Ctrl]** + camera view key Make the current view relative to your last launched missile instead of your aircraft.

Pressing any camera view key alone will switch the view to its normal mode.

